Research Paper

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Management of Open Fractures of Shaft of Tibia in Adults-A Comparative Study

Medical Science

KEYWORDS :

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Introduction:

Open fractures of the tibia remain a formidable injury in todays motorized society for two reasons-they are common and they can be very challenging fractures to care for. Treating the spectrum of bone and soft tissue injuries that accompany open fractures of the tibia requires experience and judgement, an inadequate or inappropriate tratement can lead to severe complications and major disability.

The prolonged nature of treatment of open tibial fracture frequently results in disruption of all aspects of patient's life, high health service expenditure and loss of productivity to nation. The higher the expectation by the patient and the society for improved functional outcome from the treatment of the tibial fractures continue to challenge the surgeon. The presence of contamination is the major difference between the open and the closed fractures. If, by proper tissue management contamination is prevented from progressing to infection, the open fracture will heal in a similar way as the closed fracture.

The fundamental principles of management of open fractures of the tibia are well accepted; these include immediate exploration, irrigation and debridement, bony stabilization appropriate use of antibiotic therapy repeated wound debridement and early soft tissue coverage is published in various series by Burgess AR[1], Chapman2, Rhinelander3, Gustillo RB[4] etc.

The methods used for bony stabilization continue to be a topic of controversy. Regardless of the treatment method chosen, restoration of structural stability and maintanence of acceptable mechanical axis for tibial shaft with maximal functional restoration are the criteria of successful treatment. The possibility of further soft tissue damage from the proposed treatment must be weighed when considering the treatment options. The options include broadly cast immobilization, open reduction and internal fixation with plates, screws, external fixation and intramedullary nailing.

James Ellis5 in his editorial comment on the treatment of fractures has stated that only way in which a surgeon can help a fracture to unite is to ensure that the fractured bony surfaces are placed in contact and they can only create conditions that favour the natural process. The essential in the treatment of the fracture is to treat the patient and not the radiograph.

Objectives of the study:

a) To assess the time taken for union of the fracture.
b) To determine the complications during the course of management of the open fractures of the tibia.
c) To analyze the final function outcome following treatment of open fractures of shaft of tibia.

Materials and methods:

A total of 48 cases of fresh tibial fractures in skeletally mature bones over 18 years of age were taken into the study. Only diaphyseal fractures were included in the study. Intra-articular and epiphyseal and metaphyseal fractures and open Gustilo Anderson type IIIC fractures were excluded from the study.

The study was conducted in Justice K.S.Hegde Charitable hospital from 1/9/2009-30/12/2011. Among the 48 cases 16 patients underwent external fixation, 16 were managed with intramedullary nailing and 16 underwent internal fixation with plates and screws.

The necessary information after admission such as name, age, sex, nature of injury and duration since injury, mode of trauma etc were attained and tabulated. The fractures were classified as per the Gustilo Anderson classification.

As all fractures were open fractures. The first step in the management was debridement of the fractures with or without pulse lavage.

16 patients were managed with above knee casting with plaster of Paris and was continued till fracture union. No internal fixation was attempted. Fractures with severe soft tissue and periosteal erosion were managed with a flap closure.

16 patients underwent intramedullary interlocking tibial nailing with Adler nails.

Remaining 16 patients underwent internal fixation with plates and screws.

Patients with bad soft tissue and/or flap coverage underwent surgical flap coverage and/or skin grafting.

Preoperative and post operative antibiotics were administered.

Post operatively:

All patients were started on post operative crutch mobilization on post op day 2. All patients were reviewed on post operatively every 6 weeks with radiographs and duration for full weight bearing mobilization since index injury and complications under each category were tabulated. Cast was removed when tricortical union was noted. Wound care instructions were given to all patients.

Results:

a) In the present series the highest incidence of open tibial fractures was noted in the fourth decade of life.
b) 72% of all the patients who presented with open tibia fractures were men and remaining were women.

c) Road traffic accidents were the major etilogical agent in the open tibial fractures.
d) In the current series open Gustillo Anderson[6] type I were the major share (62%) of open fractures which presented to us. Type II were 20% and type IIIa were 15% and type IIIb were 3%.
e) Amongst the 16 patients who underwent casting 12 patients had full weight bearing at six months and 4 patients the period of weight bearing exceeded 6 months.
f) Amongst the 16 patients under the plate and screw category 2 patients has full weight bearing at 5 months, nine patients at 6 months and five patients beyond 6 months.
g) Amongst the 16 patients who underwent intramedullary nailing 5 patients had full weight bearing at 4 months, 5 patients at 5 months, 5 patients at 6 months and 1 patient beyond six months.
h) Complications of delayed union/non-union, malunion, infection etc were noted to be of highest incidence in the conservative management method as compared with the other techniques. Most minimal complication rate was noted in the intramedullary nailing technique. No osteomyelitis was noted.

Discussion:

Open tibial fractures, particularly those with more severe grades of soft tissue injury have been associated with high rates of malunion, non-union and deep infection. Hence, the controversy remains regarding the optimum method of treatment of these fractures.

Plaster immobilization of open fractures is still very useful in those fractures with less soft tissue damage and a stable fracture pattern. However, there is criticism that in high energy trauma, the complications are too high percentage of residual angulation. Due to these disadvantages, plates, intramedullary rods have been used in open fractures.

Spiegel and Vander Schilden[7] pointed out that plate and screw fixation has a significant complication rate by stripping the periosteum and further devascularizing the bone causing weakening under the plate and not allowing early weight bearing. Burwell8 reported a high incidence of osteomyelitis in open fracture of tibia treated by plate and screw.

Several authors like Kessler et al8 advised against reamed nails in open fractures of tibia because there is minimal soft tissue envelope surrounding the tibia to the supplement the periosteal blood supply. This envelope is injured with open fractures and the further disturbance of the intramedullary blood supply by reaming can lead to significant complications.

Currently most traumatoligists follow the Gustillo Anderson classification in determining the prognosis and management of open fractures of tibia.

Gustillo Anderson classification:

Type I:

Punctured wound 1 cm or less in diameter and relatively clean. Generally the spike of bone pierces the skin from inside out.

Type II:

Laceration more than one centimeter long without extensive damage.

Type III:

Usually >10cms long with extensive damage to soft tissue including muscle, skin, neuromuscular structures with severe crushing component.

III A:

Adequate soft tissue coverage of fractured bone despite extensive soft tissues, laceration or flaps or high energy trauma irrespective of size of wound. This includes segmental or severely comminuted fractures.

III B:

Extensive soft tissue loss with periosteal stripping and bony exposure: Massive contamination.

III C:

Extensive or minimal soft tissue loss with vascular injury requiring repairs.

Jeffrey O Anglen9 et al in a comparative study of reamed and undreamed nailing of the tibia raised the question of routine use of undreamed nailing with regard to healing potential and other postoperative complications as they found no statistically significant difference in their study and concluded the further study is warranted.

C.M Court Brown10 et al reviewed 459 patients with tibial fractures treated by primary reamed nailing. The incidence of infection was 1.8% in closed and Gustillo Anderson type I open fractures, 3.8% in type II and 9.5% in type III fractures. They concluded that the rate of infection after intramedullary nailing was comparable with those of other methods of managing those of other methods of managing these fractures.

Conclusion:

Intramedullary nailing was found to be an excellent method which could be used safely in treatment of GA type I, II and III fractures with faster fracture union and minimal complication rates. Regardless of method of treatment chosen the main objective of treatment is carrying an early and thorough debridement and early wound coverage.

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